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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/805,966	03/22/2004	Vikram Singh	2003-42/43	2603

7590 03/18/2008

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EXAMINER	
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ART UNIT	PAPER NUMBER
1792	
MAIL DATE	DELIVERY MODE
03/18/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/805,966	SINGH ET AL.	
	Examiner	Art Unit	
	Luz L. Alejandro	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12/18/07*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9,11-25 and 27-32* is/are pending in the application.

4a) Of the above claim(s) *6,22 and 23* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,7-9,11-21,24,25,27,28 and 30-32* is/are rejected.

7)☒ Claim(s) *5 and 29* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claims 5 and 29 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claims 5 and 29 fails to further limit the subject matter of the previous claim because independent claims 1 and 24, respectively, have been amended to recite the limitation "a coil adjuster positioned in the parasitic antenna that adjusts a number of turns of the parasitic antenna for tuning the ionic plasma by parasitically damping".

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-4, 7-9, and 11-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1-line 10, recites the limitation "a platen for holding a target and biasing the target with a negative voltage". It should be noted that as recited in the claim applicant has failed to further limit the claimed apparatus since a structural limitation with respect to the apparatus further comprising a bias structure for biasing the target with a negative voltage has not been claimed. Correction and/or clarification is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-3, 7-8, 11 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,567,268 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817.

Kadomura shows the invention as claimed including a plasma apparatus comprising: a plasma chamber configured to receive a process gas; a radio frequency source 39 configured to resonate radio frequency currents in a radio frequency antenna;

a radio frequency antenna including an active antenna (22 or 31) surrounding the plasma chamber and coupled to the RF source at a first end and coupled to ground at a second end and a parasitic antenna (31 or 22) surrounding the plasma chamber to provide parasitic effect, wherein the parasitic antenna is not directly coupled to any RF source; and a platen 29 for holding a target, wherein electromagnetic fields induced by the radio frequency currents are effective to pass into the plasma chamber and excite and ionize the process gas to generate plasma within the plasma chamber (see figs. 2-3 and their description).

Kadomura does not expressly disclose that the target is bias with a negative voltage. The APA discloses applying a negative voltage bias to the target in order to implant ions into the target. Furthermore, Trow et al. discloses biasing the target with a negative voltage in order to increase ion implantation in the target. Therefore, in view of these disclosures, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura as to bias the target with a negative voltage in order to attract and implant ions into the target.

Kadomura, APA and Trow do not expressly disclose the claimed coil adjuster for adjusting a number of turns of the parasitic antenna. Okumura et al. discloses a coil adjuster 72/64,66/82,83/93 for adjusting the length and the number of turns of a coil (see figs. 13, 20-23 and their descriptions). Chen et al. discloses a coil adjuster 117 for adjusting the length and the number of turns of a coil (see figs. 2, 6 and 8, and their descriptions). Becker et al. discloses a coil adjuster 24/25 for adjusting the length and the number of turns of a coil (see fig. 2 and its description). In view of these

disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA and Trow et al., so as to allow the coils to have their lengths and turns adjusted as suggested by Okumura et al., Chen et al. or Becker et al. because in such a way the plasma density can be effectively controlled and adjusted.

Concerning claims 2-3, note that the active antenna can be considered either the vertically or the horizontally extending coil (22 or 31) depending upon which coil has the RF power applied. Furthermore, note that the parasitic antenna (31 or 22) can be considered either the vertically or the horizontally extending coil depending upon which coil is left open.

Regarding claim 7, note that the inner diameter of each antenna is greater than a size of the target.

With respect to claim 8, note that the parasitic antenna can be considered to be above and coaxial with the active antenna.

Concerning claim 11, the plasma chamber includes: a horizontal planar section 24 positioned above the platen 29; a vertical cylindrical section extending from the horizontal planar section; and a top section 21 coupled to the vertically cylindrical section.

With respect to claim 16, Trow et al. further discloses where a top conductive section of the apparatus is cooled by liquid (see col. 4-lines 40-50). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura so as to cool by liquid

because liquid is shown to be an adequate means of cooling a top conductive member of a plasma apparatus.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,567,268 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, as applied to claims 1-3, 7-8, 11 and 16, and further in view of Sahin et al., U.S. Patent 6,465,051.

Kadomura, APA, Trow et al., Okumura et al., Chen et al. and Becker et al. are applied as above but do not expressly disclose where the parasitic antenna has one of its ends grounded. Sahin et al. discloses grounding an antenna 26 during processing, for example, in order to perform a cleaning process (see fig. 1 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow, and Okumura et al., Chen et al. or Becker et al., so as to allow for grounding of either of the antennas to allow for more flexibility when using the apparatus, for example, to allow for efficient cleaning of the apparatus.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,567,268 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et

al., US 6,899,817, as applied to claims 1-3, 7-8, 11 and 16, and further in view of Ishimaru, U.S. Patent 5,681,418.

Kadomura, APA, Trow et al., Okumura et al., Chen et al. and Becker et al. are applied as above but do not expressly disclose wherein at least one antenna is liquid cooled. Ishimaru discloses forming a coil 40 which flows liquid water coolant therethrough (see col. 5-lines 13-21). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow et al., and Okumura et al., Chen et al. or Becker et al., so as to liquid cool the antenna because in such a way overheating of the antenna can be prevented.

Claims 12-13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,567,268 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, as applied to claims 1-3, 7-8, 11 and 16, and further in view of Collins et al., U.S. Patent 5,556,501.

Kadomura, APA, Trow et al.,Okumura et al., Chen et al. and Becker et al. are applied as above but do not expressly disclose wherein the vertical cylindrical section is made of a high quality dielectric, and the top conductive section is made of aluminum and grounded. Collins et al. discloses wherein a vertical cylindrical section 17W is made of a dielectric, and the top conductive section 17T is made of aluminum and grounded (see fig. 1 and its description). In view of this disclosure, it would have been

obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow et al., and Okumura et al., Chen et al. or Becker et al., so as to comprise the vertically cylinder and top conductive section of Collins et al. because this will allow the improvement of process uniformity.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,567,268 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, and Collins et al., U.S. Patent 5,556,501, as applied to claims 12-13 and 15 above, and further in view of Fitzsimmons et al., U.S. Patent 6,626,188.

Kadomura, APA, Trow et al.,Okumura et al., Chen et al., Becker et al. and Collins et al. are applied as above but do not expressly disclose wherein the ceramic material is one from a list including aluminum nitride. Fitzsimmons et al. discloses having aluminum nitride walls exposed to the plasma within the chamber (see fig. 3 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA, or Trow et al., and Okumura et al., Chen et al. or Becker et al., and Collins et al. so as to form aluminum nitride in the plasma chamber because in such a way beneficial results will be produced such as the reduction of contamination.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,567,268 in view of the Admitted Prior Art (APA) or Trow, US

5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, as applied to claims 1-3, 7-8, 11 and 16, and further in view of Kumagai, U.S. Patent 5,916,455.

Kadomura, APA, Trow et al.,Okumura et al., Chen et al. and Becker et al. are applied as above but do not expressly disclose a plasma igniter for introducing a strike gas into the plasma chamber to assist in igniting a plasma. Kumagai discloses a plasma igniter 30 for introducing a strike gas into the plasma chamber to assist in igniting a plasma (see fig. 1-2 and their descriptions). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA, or Trow et al., and Okumura et al., Chen et al. or Becker et al., so as to comprise a plasma igniter because in such a way plasma will be more easily ignited for processing within the apparatus.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,567,268 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, as applied to claims 1-3, 7-8, 11 and 16, and further in view of Collins, U.S. Patent 5,707,486.

Kadomura, APA, Trow et al., Okumura et al., Chen et al. and Becker et al. are applied as above but do not expressly disclose a gas source controller for maintaining a pressure of a plasma chamber at a predetermined value. Collins discloses a controller for controlling the pressure of a plasma chamber (see col. 13-lines 6-20). In view of this

disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow et al., and Okumura et al., Chen et al. or Becker et al., so as to include the controller of Collins to control the pressure of the plasma chamber because such a device would allow for greater controllability over the process performed within the apparatus.

Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,567,268 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, as applied to claims 1-3, 7-8, 11 and 16, and further in view of Collins et al., U.S. Patent 5,556,501.

Kadomura, APA, Trow et al., Okumura et al., Chen et al. and Becker et al. are applied as above but do not expressly disclose the RF source operating at a low frequency. Collins et al. discloses a RF source 31 which has a frequency in a range from 100kHz to 100 Mhz (see col. 11-lines 25-40). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA, or Trow et al., and Okumura et al., Chen et al. or Becker et al., so as to provide the RF source of Collins et al. because this will allow for the selection of a top source which minimizes damage to sensitive devices and also provides efficient inductive coupling.

Claims 24-25, 27 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,567,268 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, and Collins et al., U.S. Patent 5,556,501.

Kadomura shows the invention substantially as claimed including a plasma chamber comprising: a horizontal planar section for positioning above a platen; a vertical cylindrical dielectric section 21 extending from the horizontal planar section; and a radio frequency antenna including a horizontally-extending coil 22 positioned proximate to the horizontal planar dielectric section and a vertically-extending coil 31 positioned proximate to the vertical cylindrical dielectric section, the radio frequency antenna including radio frequency currents into the plasma chamber that excite and ionize a process gas so as to generate a plasma in the plasma chamber (see fig. 2 and its description).

Kadomura does not expressly disclose that the target is bias with a negative voltage. The APA discloses applying a negative voltage bias to the target in order to implant ions into the target. Furthermore, Trow et al. discloses biasing the target with a negative voltage in order to increase ion implantation in the target. Therefore, in view of these disclosures, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura as to bias the target with a negative voltage in order to attract and implant ions into the target.

Kadomura, APA and Trow et al. do not expressly disclose the claimed coil adjuster for adjusting a number of turns of the parasitic antenna. Okumura et al.

discloses a coil adjuster 72/64,66/82,83/93 for adjusting the length and the number of turns of a coil (see figs. 13, 20-23 and their descriptions). Chen et al. discloses a coil adjuster 117 for adjusting the length and the number of turns of a coil (see figs. 2, 6 and 8, and their descriptions). Becker et al. discloses a coil adjuster 24/25 for adjusting the length and the number of turns of a coil (see fig. 2 and its description). In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow et al., so as to allow the coils to have their lengths and turns adjusted as suggested by Okumura et al., Chen et al. or Becker et al. because in such a way the plasma density can be effectively controlled and adjusted.

With respect to the limitation of a liquid cooled top conductive section coupled to the vertical section. Trow et al. further discloses where a top conductive section of the apparatus is cooled by liquid (see col. 4-lines 40-50). Additionally, Collins et al. discloses a plasma chamber comprising a cooled top conductive section 17T coupled to a vertical dielectric section 17W (see fig. 1 and its description). In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura so as to include a liquid cooled top conductive section coupled to the vertical dielectric section as disclosed by Collins et al. or Trow et al., because in such a way the coupling of the plasma with the wafer will be improved while at the same time having improved controllability of the temperature of the chamber walls, and because liquid is shown to be an adequate means of cooling a top conductive member of a plasma apparatus.

Concerning claim 25, note that in the apparatus of Kadomura modified by APA, Trow et al., Okumura et al., Chen et al., Becker et al., and Collins et al., the top conductive section is grounded (see Collins et al. at col. 21-lines 60-67).

With respect to claim 31, note that in the apparatus of Kadomura modified by APA, Trow et al., Okumura et al., Chen et al., Becker et al., and Collins et al., the horizontally extended coil 22 is capable of being coupled to an RF source.

Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,567,268 in view of in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, and Collins et al., U.S. Patent 5,556,501, as applied to claims 24-25, 27, and 31 above, and further in view of Sahin et al., U.S. Patent 6,465,051.

Kadomura, APA, Trow et al., Okumura et al., Chen et al., Becker et al. and Collins et al., are applied as above but does not expressly disclose where the parasitic antenna has one of its ends grounded. Sahin et al. discloses grounding an antenna 26 during processing, for example, in order to perform a cleaning process (see fig. 1 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow et al., and Okumura et al., Chen et al. or Becker et al., and Collins et al. so as to allow for grounding of either of the antennas to allow for more

flexibility when using the apparatus, for example, to allow for efficient cleaning of the apparatus.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,567,268 in view of in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, and Collins et al., U.S. Patent 5,556,501, as applied to claims 24-25, 27, and 31 above, and further in view of Ishimaru, U.S. Patent 5,681,418.

Kadomura, APA, Trow et al., Okumura et al., Chen et al., Becker et al., and Collins et al., are applied as above but do not expressly disclose wherein at least one antenna is liquid cooled. Ishimaru discloses forming a coil 40 which flows liquid water coolant therethrough (see col. 5-lines 13-21). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow et al., and Okumura et al., Chen et al. or Becker et al., Collins et al. so as to liquid cool the antenna because in such a way overheating of the antenna can be prevented.

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 5,567,268 in view of in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, and Collins et al., U.S. Patent 5,556,501, as applied to claims 24-25, 27, and 31 above, and further in view of Kumagai, U.S. Patent 5,916,455.

Kadomura, APA, Trow et al., Okumura et al., Chen et al., Becker et al., and Collins et al. are applied as above but do not expressly disclose a strike gas inlet. Kumagai discloses a strike gas inlet (see ignition chamber 30) whereby plasma is ignited and expelled into the inductively coupled plasma chamber (see fig. 1-2 and their descriptions). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow et al., and Okumura et al., Chen et al. or Becker et al., and Collins et al. so as to comprise a strike gas inlet because in such a way plasma will be more easily ignited for processing within the apparatus.

Claims 1-3, 7-8, 11 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 6,096,160 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817.

Kadomura shows the invention as claimed including a plasma apparatus comprising: a plasma chamber (51,57) configured to receive a process gas; a radio frequency source 66 configured to resonate radio frequency currents in a radio frequency antenna; a radio frequency antenna including an active antenna 52 surrounding the plasma chamber and coupled to the RF source at a first end and coupled to ground at a second end and a parasitic antenna 53 surrounding the plasma chamber to provide a parasitic effect, wherein the parasitic antenna is not directly coupled to any RF source; and a platen 59 for holding a target, wherein electromagnetic

fields induced by the radio frequency currents are effective to pass into the plasma chamber and excite and ionize the process gas to generate plasma within the plasma chamber (see figs. 5-6 and their descriptions).

Kadomura does not expressly disclose the claimed coil adjuster for adjusting a number of turns of the parasitic antenna. Okumura et al. discloses a coil adjuster 72/64,66/82,83/93 for adjusting the length and the number of turns of a coil (see figs. 13, 20-23 and their descriptions). Chen et al. discloses a coil adjuster 117 for adjusting the length and the number of turns of a coil (see figs. 2, 6 and 8, and their descriptions). Becker et al. discloses a coil adjuster 24/25 for adjusting the length and the number of turns of a coil (see fig. 2 and its description). In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura so as to allow the coils to have their lengths and turns adjusted as suggested by Okumura et al., Chen et al. or Becker et al. because in such a way the plasma density can be effectively controlled and adjusted.

Concerning claims 2-3, note that the active antenna can be considered either the vertically or the horizontally extending coil since it is two-dimensional and extends in both a horizontal and vertical direction. Furthermore, note that the parasitic antenna can also be considered either the vertically or the horizontally extending coil since it is two-dimensional and extends in both a horizontal and vertical direction.

With respect to claims 7-8, Kadomura does not expressly disclose that an inner diameter of each antenna is greater than the size of the target, and wherein the parasitic antenna is above and coaxial with the active antenna. However, concerning

the inner diameter of each antenna, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum diameter of the antenna based upon a variety of factors including the desired plasma density distribution and such limitation would not lend patentability to the instant application absent a showing of unexpected results. With respect to the location of the parasitic antenna, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the position of the parasitic antenna and the active antennas based upon a variety of factors including the desired plasma density distribution and such limitation would not lend patentability to the instant application absent a showing of unexpected results. Furthermore, rearrangement of parts has been held to have been obvious.

With respect to claim 11, note that Kadomura further discloses a plasma chamber that includes: a horizontal planar section 56 positioned above the platen 59; a vertical cylindrical section extending from the horizontal planar section; and a top section 51 coupled to the vertically cylindrical section.

With respect to claim 16, Trow et al. further discloses where a top conductive section of the apparatus is cooled by liquid (see col. 4-lines 40-50). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura so as to cool by liquid because liquid is shown to be an adequate means of cooling a top conductive member of a plasma apparatus.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 6,096,160 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, as applied to claims 1-3, 7-8, 11, and 16 above, and further in view of Ishimaru, U.S. Patent 5,681,418.

Kadomura, APA, Trow et al., Okumura et al., Chen et al., Becker et al., are applied as above but do not expressly disclose wherein at least one antenna is liquid cooled. Ishimaru discloses forming a coil 40 which flows liquid water coolant therethrough (see col. 5-lines 13-21). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow et al., and Okumura et al. Chen et al. or Becker et al., so as to liquid cool the antenna because in such a way overheating of the antenna can be prevented.

Claims 12-13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 6,096,160 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, as applied to claims 1-3, 7-8, 11, and 16 above, and further in view of Collins et al., U.S. Patent 5,556,501.

Kadomura, APA, Trow et al., Okumura et al., Chen et al., Becker et al., are applied as above but do not expressly disclose wherein the vertical cylindrical section is made of a high quality dielectric, and the top conductive section is made of aluminum

and grounded. Collins et al. discloses wherein a vertical cylindrical section 17W is made of a dielectric, and the top conductive section 17T is made of aluminum and grounded (see fig. 1 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow et al., and Okumura et al. Chen et al. or Becker et al., so as to comprise the vertically cylinder and top conductive section of Collins et al. because this will allow the improvement of process uniformity.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 6,096,160 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, and Collins et al., U.S. Patent 5,556,501 as applied to claims 12-13 and 15 above, and further in view of Fitzsimmons et al., U.S. Patent 6,626,188.

Kadomura, APA, Trow et al., Okumura et al., Chen et al., Becker et al., and Collins et al. are applied as above but do not expressly disclose wherein the ceramic material is one from a list including aluminum nitride. Fitzsimmons et al. discloses having aluminum nitride walls exposed to the plasma within the chamber (see fig. 3 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow et al., and Okumura et al., Chen et al. or Becker et al., and Collins et al. so as to form aluminum nitride in the plasma chamber because in such a way beneficial results will be produced such as the reduction of contamination.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 6,096,160 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, as applied to claims 1-3, 7-8, 11, and 16 above, and further in view of Kumagai, U.S. Patent 5,916,455.

Kadomura, APA, Trow et al., Okumura et al., Chen et al., and Becker et al., are applied as above but do not expressly disclose a plasma igniter for introducing a strike gas into the plasma chamber to assist in igniting a plasma. Kumagai discloses a plasma igniter 30 for introducing a strike gas into the plasma chamber to assist in igniting a plasma (see fig. 1-2 and their descriptions). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow et al., and Okumura et al. Chen et al. or Becker et al., so as to comprise a plasma igniter because in such a way plasma will be more easily ignited for processing within the apparatus.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 6,096,160 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, as applied to claims 1-3, 7-8, 11, and 16 above, and further in view of Collins, U.S. Patent 5,707,486.

Kadomura, APA, Trow et al., Okumura et al., Chen et al., and Becker et al., are applied as above but do not expressly disclose a gas source controller for maintaining a pressure of a plasma chamber at a predetermined value. Collins discloses a controller for controlling the pressure of a plasma chamber (see col. 13-lines 6-20). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA, Trow et al., and Okumura et al. Chen et al. or Becker et al., so as to include the controller of Collins to control the pressure of the plasma chamber because such a device would allow for greater controllability over the process performed within the apparatus.

Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura, U.S. Patent 6,096,160 in view of the Admitted Prior Art (APA) or Trow, US 5,824,607 and Okumura et al., US 5,888,413, Chen et al., US 6,527,912 or Becker et al., US 6,899,817, as applied to claims 1-3, 7-8, 11, and 16 above, and further in view of Collins et al., U.S. Patent 5,556,501.

Kadomura, APA, Trow et al., Okumura et al., Chen et al., and Becker et al., are applied as above but do not expressly disclose the RF source operating at a low frequency. Collins et al. discloses a RF source 31 which has a frequency in a range from 100kHz to 100 Mhz (see col. 11-lines 25-40). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kadomura modified by APA or Trow et al., and Okumura et al. Chen et al. or Becker et al., so as to provide the RF source of Collins et al. because

this will allow for the selection of a top source which minimizes damage to sensitive devices and also provides efficient inductive coupling.

Response to Arguments

Applicant's arguments, see pages 11-13 of the remarks, filed 12/18/07, with respect to the Okumura et al., US 6,875,307 reference, have been fully considered and are persuasive, and therefore, the rejection of the claims over the reference has been withdrawn. However, applicant's arguments with respect to claims 1-5, 7-9, 11-21, 24-25 and 27-32, using the Kadomura, US 5,567,268 and the Kadomura, US 6,096,160 references, have been considered but are moot in view of the new ground(s) of rejection. Furthermore, applicant argues that the antenna mentioned in Kadomura '268 and Kadomura '160, as being the parasitic antenna will not be the parasitic antenna because it does not perform the same function as the parasitic antenna of the instant invention. However, the examiner believes that the parasitic antenna of Kadomura will perform the same function as in the instant application, and no secondary evidence has been provided by the applicant to show otherwise. Either of the antennas in Kadomura can be considered parasitic because they have switches that enable the antenna to be not connected to the RF power supply (making this antenna parasitic), while the other antenna can be connected to the RF power supply and be an active antenna (see figs. 2-3), thereby allowing the plasma chamber to be tuned by parasitic damping via the parasitic antenna and disclosing the claimed invention. Additionally, in response to applicant's argument that the Kadomura '268 and Kadomura '160 do not intend that

their apparatuses be used with a parasitic antenna, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 571-272-1430. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Luz L. Alejandro/
Primary Examiner, Art Unit 1792

March 11, 2008